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A visual network perspective on social interaction and space: Using Net-Map and VennMaker in participatory social-spatial research

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Abstract

Various network paradigm approaches are increasing in significance in the field of social-spatial sciences. In recent times, scholars engaged in research related to spatial features have more frequently grasped and explained social structures and discourses using an analytical network perspective. A relatively young strand of Social Network Analysis (SNA) is Visual Network Research, which uses network maps to gather and analyse social relationships, mostly using participative methods. This article discusses the specific possibilities and challenges that emerge by applying a visual network perspective in social-spatial sciences. Therefore, two different tools for visual data collection are introduced by presenting exemplary case studies that discuss the processes of space constitution. Net-Map is a pen-and-paper tool and is meant to manually draw multiplex networks in cooperation with interview partners or focus groups. By doing so, qualitative and quantitative network data are collected. Additionally, the influence, aims and roles of different actors are evaluated in relation, for example, to spatial scales or resources. The VennMaker tool offers cooperative network reconstruction through computer software. It generates a digital network map, collects quantitative relational and attributive data and provides a simultaneous qualitative triangulation of these data. Finally, the article discusses the advantages and disadvantages of the different tools and suggests a conceptual and methodological combination of Visual Network Research and the relational sociology of space for a richer understanding of social action and space.

Visual research methods; participatory methods; social network analysis; mixed methods; constitution of space; transition town movement; world music

Zusammenfassung

Eine visuelle Netzwerkperspektive auf soziale Interaktion und Raum: Partizipative Forschung in den Raumwissenschaften mit Net-Map und VennMaker

Die verschiedenen Zugänge der Netzwerkforschung gewinnen in den Raumwissenschaften zunehmend an Bedeutung. In jüngster Zeit nutzen Wissenschaftlerinnen und Wissenschaftler im Rahmen raumbezogener Forschungsarbeiten immer häufiger eine analytische Netzwerkperspektive um soziale Strukturen und Diskurse zu erfassen und zu erklären. Eine relativ junge Ausprägung der Sozialen Netzwerkanalyse (SNA) ist die Visuelle Netzwerkforschung, die mit Hilfe von sogenannten Netzwerkkarten soziale Beziehungen in meist partizipativen Verfahren erhebt und analysiert. Der Beitrag diskutiert die spezifischen Chancen und Herausforderungen dieser visuellen Netzwerkperspektive in der Raumforschung, indem er die Verwendung von Netzwerkarten in zwei unterschiedlichen Erhebungswerkzeugen vorstellt und raumbezogene Fragestellungen an exemplarischen Fallstudien diskutiert. Net-Map ist ein Pen-and-Paper-Instrument und ermöglicht das manuelle Zeichnen von multiplexen Netzwerken zusammen mit Interviewpartnern oder Fokusgruppen. Dabei werden qualitative und quantitative Netzwerkdaten, eine Bewertung des Einflusses, der Ziele und Rollen beispielsweise in Bezug zu Raumskalen oder Ressourcen der Akteure generiert. Die Software VennMaker ist ebenfalls ein Werkzeug zur partizipatorischen Netzwerkrekonstruktion, hier werden die Netzwerke zusammen mit den Interviewpartnern am Computer gezeichnet. Damit kann eine (digitale) Netzwerkkarte erstellt und zeitgleich quantitative relationale und attributive Daten erhoben und kommunikativ mit qualitativen Daten trianguliert werden. Der Beitrag diskutiert anhand der raumbezogenen Anwendungsbeispiele Vor- und Nachteile der beiden Werkzeuge und schlägt eine konzeptionell-methodische Kombination von Visueller Netzwerkforschung und relationaler Soziologie des Raumes vor, um so zu einem tieferen Verständnis des Zusammenhanges von sozialem Handeln und Raum zu gelangen.

Visuelle Forschungsmethoden; Partizipative Methoden; Soziale Netzwerkanalyse; Mixed Methods; Konstitution von Raum; Transition-Town-Bewegung; Weltmusik

Introduction

Networks are everywhere. For more than two decades, the concept has been widely used in the context of different disciplines (e.g., Grabher 2006; Kenis/Raab 2008; Holzer 2009) and frequently mentioned in policy debates, e.g., as a decentralized or collective form of organizing. Moreover, in times of the excessive growth of social media, it seems to be essential for every individual to be part of a social network (e.g., Gamper et al. 2012). However, the term is usually used as a mere metaphor, without a distinct definition of its features. The broad application of the term '*network*' and the diversity of different strands of network research in several sciences show that a unitary network theory does not exist but that network research can be conceived of as a specific perspective for the investigation of social structures (Emirbayer/Goodwin 1994). To prevent misunderstandings, the generic character of the term calls for a precise definition of the network under consideration (Scott 2002; Lelong 2014). In this article, we draw on the analytical concept of *Social Network Analysis (SNA)*, which dates back to Simmel's early work in 1890 on "webs of affiliation", in which he describes actors as "linked through specific types of connections" (Grabher 2006, p. 164). Most of the work in *Social Network Analysis* refers to Mitchell's basic notion, which defines networks as a specific set of linkages among actors, "with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behaviour of the actors involved" (Mitchell 1969). Based on this fairly general and abstract definition, network researchers use a differentiated set of research tools to investigate not only how network structures promote or constrain social action and perception (Diaz-Bone 2007) but also how actors use their network relations to realize their own objectives (Emirbayer/Goodwin 1994). Additionally, the network perspective facilitates the study of not only formal but also informal relations in or across organizations. Recent approaches to network analysis take into account, among other things, the dynamics of network development (i.e., of any actor constellation), the subjective meaning of actors and the contingency of human agency (White 1992; Emirbayer/Goodwin 1994; Jansen 2006). The abstractness of network research requires few presuppositions and is, consequently, applicable to all sorts of actor types and ties, including events and places. Due to its formalistic set of tools and concepts, network research helps structure and systemize complex information and data. In this way, it fosters the comparability of structures.

Visual Network Research

Social network researchers collect data that describe patterns of relationships among individual or collective actors (e.g., friendship, kinship, support, interdependence). They analyse these data by employing concepts drawn from graph theory. Collecting and analysing these data (e.g., number of nodes and links, density, centrality measures) has so far been carried out using highly complex methodologies requiring considerable effort from qualified research staff. In contrast, *Visual Network Research* (Schönhuth et al. 2013) has been developed as an alternative strand of the mainly quantitative research approaches and is a hybrid between visual research methods (Knoblauch et al. 2008) and a mixed-method approach to *Social Network Analysis* (Hollstein/Dominguez 2014).

From its very beginning in the 1930s, network analysis has applied visualizations. In the 1950s, Elisabeth Bott used network pictures and network maps when gathering data for egocentric network analysis (Bott 1957). Observed in the context of a long tradition of haptic imaging methods, the field of visual research methods independently evolved in the 1980s in applied development research (Chambers 1985) and in socio-psychological family research focusing on social support (Kahn/Antonucci 1980). Whereas classical network research locates the visualization of networks at the end of the analysis, *Visual Network Research* places visualizations at the centre of the research process. These visualizations can be used either for structural analysis (see, e.g., Herz et al. 2015) or as an instrument of data collection and data triangulation. Participants can be involved in the structural development of their network as (co-) producers and analysts of their own network images – whether in a scientific context or in a consultative capacity. This paper concentrates on the presentation and discussion of the use and the potential of visualization of participative data collection and data triangulation in network-orientated socio-spatial research. However, it is possible and desirable from a *Visual Network Research* perspective to integrate visualizations into all steps of the research process and into, e.g., heuristics, analysis and presentation (see Schönhuth/Gamper 2013, pp.15–20).

A network perspective on the constitution of space

Regarding research with a social-spatial focus, the network perspective can be utilized to analyse the (mutual) influence of space on social structures and vice versa. Network research in non-spatial sciences often focuses on social structures and processes that in all likelihood occur in many different contexts, without explicitly discussing the spatial dimension. On the one hand, such a non-spatial approach adds a universalistic perspective to social phenomena (Glückler 2002), whereas many studies, such as those in the field of urban studies, widely concentrate on the idiosyncrasies of empirical cases, without adopting a more generalist point of view on human interaction. However, it may neglect relevant explanatory factors of social behaviour that result from spatial structures. Therefore, we assume that the universalistic perspective of network analysis and the context-specific perspective of spatial sciences can complement one another to enable a richer understanding of social action and space. Being a part of this research

agenda, our paper aims at discussing the potentials of *Visual Network Research* for analysing the processes of space constitution (Löw 2001). In this context, *Visual Network Research* seems especially fruitful because of its straightforwardness in collecting and analysing network data, its mixed-methods approach and its participatory character.

When discussing space, we refer to Löw's relational theory of space (Löw 2001), which is influenced by Gidden's theory of structuration (Giddens 1984). Following Löw, we assume that space structures human action – e.g., constraining or enabling it – and that human action structures space. This implies that space is not a pre-existing element but socially constructed in a continuous interaction of space, time and social action (Amin 2004; Thrift 2003). Löw's relational theory of space rejects the distinction between physical and the social space (Löw 2001, p. 179–183). By analysing the constitution of space as a process of both *Spacing* and *Synthesis*, Löw firmly couples the physical and social dimensions of space. According to Löw, space is constituted by the "situating of social goods and people and/or the positioning of primarily symbolic markings in order to render ensembles of goods and people recognizable as such (e.g. exit and entry signs to localities). *Spacing* means erection, building, or positioning" (Löw 2008: 35). *Synthesis*, then, comprises "processes of perception, ideation, or recall", which connect the aforementioned elements and by so doing constitute space (Löw 2008, p. 35). There is no pre-existing type of space because its constitution is always related to a certain perspective that, as Löw argues, humans are learning through social processes (Löw 2001, p. 54).

In our paper, we present two case studies. In both cases, the original research design starts with a research agenda that investigates governance or production *of* or *in* territorial entities – a perspective that follows the container concept of an absolute space (i.e., the administrative boundary of cities) that is independent of the subjective perspective. Consequently, the constraining or enabling effects of human action on space may be addressed with the following questions: How are places produced? What hinders cooperation in a given region? In this sense, *Social Network Analysis* is frequently used in, for example, natural resource management and environmental governance research (Scott 2015). However, this perspective reduces space to boundary drawing and neglects relevant explanatory factors of spatial structures in social behaviour. Therefore, we additionally discuss the action-theoretical perspective in relation to space in our case studies. We delineate the type of research questions that could be investigated, and we reflect on the steps that should be considered while network mapping with a focus on space constituting processes.

The article is structured as follows: in chapter two, we provide an overview of the of the *pen-and-paper* network mapping tool *Net-Map,* which is then adapted to a participatory study investigating the structure of a transition town movement in a German city. In this paper we publish for the first time results of this already completed study. In chapter three, we present the digital network mapping tool *VennMaker,* which is subsequently utilized to examine the *Transcultural Spaces of Music* of a musician network. This study is still ongoing and we present first results in this paper. Both original case studies didn´t explicitly use the relational theory of space from LÖW. Discussing the empirical findings of the presented studies in the context of the relational theory of space is one of the additional merits of this methodological paper. In chapter four, we outline the prospects of *Visual Network Research* generally and specifically regarding the constitution of space. By comparing our experiences, we discuss the advantages and disadvantages of *Net-Map* and *VennMaker* for the different phases of the research process (type of research, preparation costs, data collection, data processing, data analysis). Furthermore, we address the ethical issues that emerge in performing network research. Finally, we end with a conclusion about the potentials of *Visual Network Research* for a richer understanding of social action and space.

Net-Map: using pen-and-paper for Visual Network Research

Net-Map is an interview-based *pen-and-paper* network mapping tool that helps understand, visualize, discuss, monitor, evaluate and improve situations in which many different actors with diverse interests and often conflicting goals influence outcomes (Schiffer/Hauck 2010). *Net-Map* can be used as a tool to facilitate group discussions in order to jointly analyse stakeholder situations. The tool can also be used for individual interviews. The participatory approach is particularly suitable for transdisciplinary processes in addressing small networks (up to 30 actors) and exploratory studies aiming to understand network situations (Hauck et al. 2015). A large body of literature describes the data collection processes using the *Net-Map* tool (e.g., Schiffer/Hauck 2010; Hauck 2010; Bell et al. 2013; Campbell et al. 2014; Hauck et al. 2015; Hauck et al. 2026); therefore, we only briefly describe it here.

The case study: A transition town initiative

In the context of the EU project GLAMURS (Green Lifestyles, Alternative Models and Upscaling Regional Sustainability, www.glamurs.eu), we used *Net-Map* in a case study to analyse a transition town movement in a German medium-sized city. According to its founder, Rob Hopkins, the transition town movement can be described as community-led responses to peak oil and climate change, building resilience and happiness (Hopkins 2008). Originating in the UK, Transition Network initiatives cover many countries, such as the USA, Canada, Italy, Japan, Germany, Ireland, New Zealand, Chile and the Netherlands (Smith 2011). We organized a focus group discussion with members of the initiative using *Net-Map* as a facilitation tool, with the goals to a) use the insight for a scientific understanding of

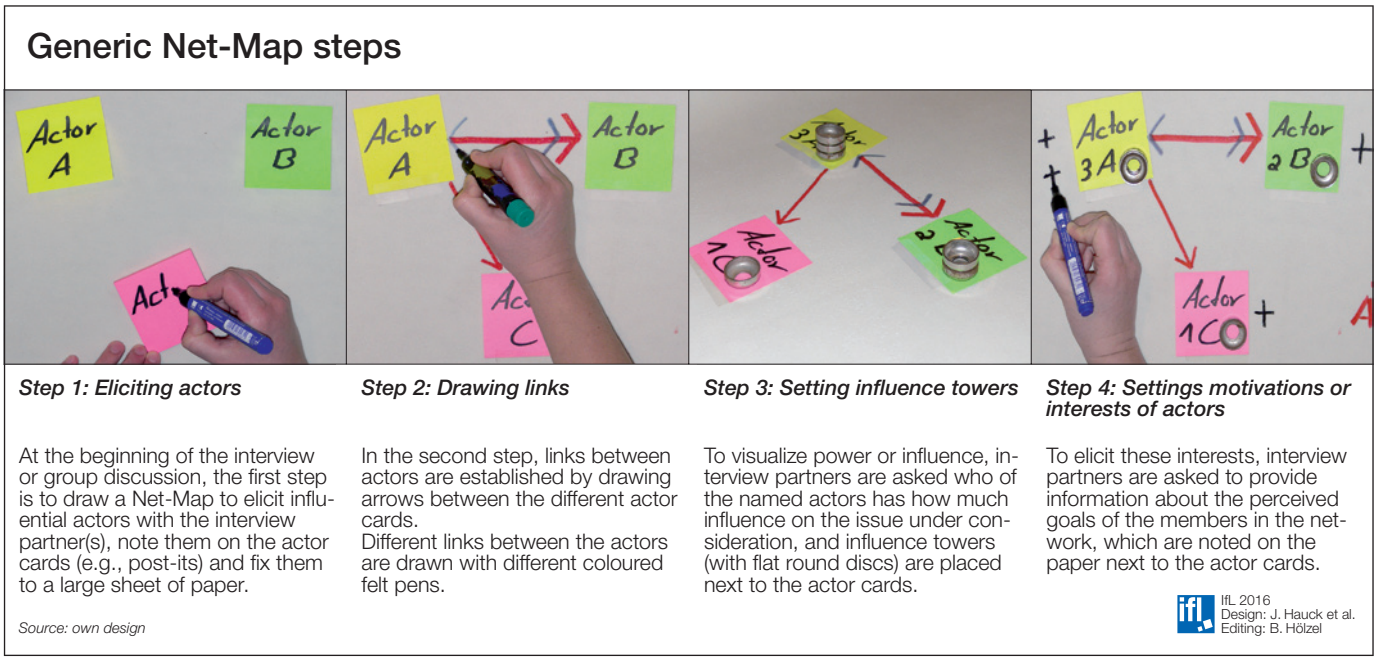

Fig. 1: Generic Net-Map steps

the network shaping the initiative and simultaneously b) to generate network knowledge and facilitate learning between the stakeholders of the transition town movement to further develop their initiative.

Implementation: Developing Net-Maps step by step

1. Before going to the field, and in preparation for the interview, a *Net-Map* question has to be formulated to guide the rest of the process. In our case study, *Net-Map* question focused on "Who has influenced the development of the initiative transition town here in the last three years?" The question also includes a definition of the types of influence the actors use, e.g., giving money, issuing commands, giving advice, exchanging particular information, or supporting each other. It is also useful to anticipate the possible goals or motivations of the actors. We pre-defined a set of motivations from which the participants could choose, which included financial/economic interests, the experience of community, wellbeing, regional prosperity, and environmental concern. If, in an exploratory setting, this information is not yet available, the definition of the types of influence or actors' goals can be part of the interview design (however, this usually takes a considerable amount of time and is therefore not always feasible). The selection of interview partners or group participants often follows a snowball sampling approach. However, a literature review has proven useful to identify actors or actor groups that are not mentioned in the interviews. Following the principles of qualitative social research, the interviews can be stopped when no more information is derived from further interviews. The *Net-Map* tool is low-tech and low-cost, and all the materials needed are easily accessible. These materials include large sheets of paper for drawing network maps, felt pens with different colours, adhesive or "Post-It" paper as actor cards, stackable discs for building influence towers, and a recording device to record the interview.
2. Data collection: The generic steps of the *Net-Map* tool used during the interview are briefly laid out in Figure 1. The interviewees mentioned 43 actors as being part of the network. They belong to the categories agricultural/food coops, citizenry, companies/economic networks, education/research/consulting, environmental governance, environmental initiatives, media, politics, social/cultural/political initiatives and initiatives that focused particularly on regional development. The influence link drawn between the actors was "support", according to the typology described above (Fig. 2). In total, the focus group consisted of eight participants, representing different projects within the transition town initiative. The research staff included two interview facilitators and one person taking notes. After the network map was drawn, we asked the interview partners to provide insight about the system as a whole and their interpretation of the network as well as to discuss possible concrete actions to improve the situation.
3. Data processing: Digitalizing the paper network data and recorded narratives for further analysis proves useful (e.g., Herz et al. 2015) but is time-consuming and error-prone. The influence, categories and motivations of the actors can be visualized by using a network visualization software (in our case, VisuaLyzer 2.2 by Medical Decision Logic, Inc. 2014, see Fig. 2). In our case study, we faced a number of limitations regarding data processing. The participants requested not to publish the network with actual names but rather to use actor categories due to concerns of data security

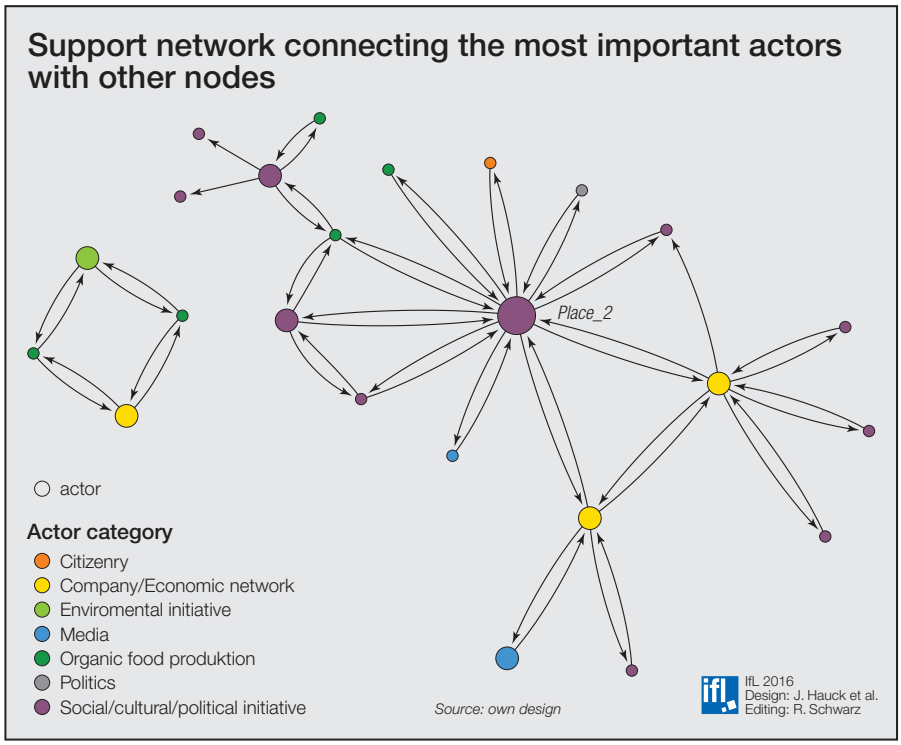

Fig. 2: Support network connecting the most important actors with other nodes

(for a more detailed discussion, see section on ethical issues). Therefore, we left the material (network map and notes) to the participants and replaced the names with codes during another meeting. As a result, we faced a serious time constraint and only parts of the network could be digitized.

4. Data analysis: The analysis of the *Net-Maps* can take different forms (e.g., Hauck et al. 2016). After digitizing the network data, e.g. the normalized, average influence can be calculated (from the number of discs each mentioned actor received during the interview; for more details, see Schiffer/Hauck 2010; Hauck 2010). Due to the limitations during data processing, we reduced the possible range of our structural analysis. However, the most important information for our research, i.e., the network narratives helping to understand the transition town movement, could still be retrieved. By discussing the generated network data during the drawing process, a large part of the qualitative analysis takes place during data collection, i.e. while applying *Net-Map* data collection and data analysis intertwine. For instance, the participants asked us to add further motivations to our prestructured sample: being autonomous and experiencing self-efficacy.

Findings: The organizational logic of the initiative

The participants emphasized that autonomy, i.e., not depending on single actors and maintaining a status without hierarchy, was of high relevance for the members of the transition town initiative. Moreover, receiving external funding was considered to be harmful for the autonomy of the initiatives, and actors receiving external funding were usually mistrusted and considered corrupted. Therefore, the interviewees excluded many of the traditional environmental NGOs from of the network because they receive some type of funding and are perceived to have a stiff hierarchy. Further qualitative analysis could comprise the in-depth analysis of actors that appear to be of specific significance, e.g. based on a high perceived influence. Figure 2 shows a significant non-human actor *Place_2* (the size of the nodes reflects the importance of the actors) that is discussed in the following section.

Discussing the constitution of space: The case of Place_2

In the initial research design we started out from a governance question, i.e. how the social entities (the members of the transition town) in a given territory (a German city) were organizing themselves. However, a new category emerged during the dialogue with the participants, who defined virtual and physical places as actors. They described a certain *Place_2* as being particularly important.

The different participants describe *Place_2* as a type of self-organized community centre that provides a facility for holding meetings, events or workshops. Because the constitution of space was not an explicit part of the initial research design of this study, the following questions could guide our future research in order to explain *Place_2's* relevance (in chap. 4, we suggest how space-related questions could guide the design of *Visual Network Research* from the outset).

Following the analytical distinction between *Spacing* and *Synthesis,* we ask whether *Place_2* forms a part of a similar *Spacing* (in relation to the members' different perspectives) and whether the corresponding *Synthesis* processes of the transition town members are similar or different (see Tab. 1). Eventually, the findings could support the following divergent explanations: (1) In the case of similar *Spacing* and similar *Synthesis* processes, *Place_2* may strongly structure peoples' actions, and/or people's schemes of perception might be similar. That means that only a selected, homogenous group may be attracted to *Place_2* (due to their expectations or needs). (2) In the case that *Spacing* processes go along with different *Synthesis,* one may assume that *Place_2* is robust to different types of perspectives. By providing several interpretations of its relevance for the transition town movement, *Place_2* may have gained its extraordinary status. A potential explanation for the importance of the place is further provided by the literature on "third places" (Oldenburg 1999, p. 20), describing those places as welcoming, comfortable, and visited by

regulars to meet old friends and make new ones. Often, third places are small businesses, cafes, coffee shops, bars, pubs, restaurants, community centres, general stores, and so on. They are in the proximity of home and work spaces and are easily accessible by many people, often offering food and drinks. The statements of the interviewees suggest that Place_2 provides these types of Spacing and Synthesis (see Tab. 1). They emphasized strongly that Place_2 is a space where they can meet, talk, maintain their relationships and create new ones. In this particular case, the place almost became the face of the initiative.

Reflection: Using network knowledge to inspire transition town movements

While the research yields a wealth of scientific results that cannot be laid out here in detail, participants' feedback on the *Net-Map* sessions was very positive. Creating an overview of who they considered to be involved the transition town initiative and how the actors are linked was perceived to be a good experience and provided a number of insights. One of the most important points for the participants was the visualization of the importance of *Place_2.* Their refusal of hierarchies in general and the vulnerability of *Place_2* to be closed down if the lease contract is not renewed led them to plan and realize an alternative place.

VennMaker: a digital tool for Visual Network Research

VennMaker is a digital network mapping tool that offers a cooperative network reconstruction and visual network data collection using computer software. It enables users to interactively collect network relationship data from an actor's point of view and render the data comparable and quantitatively analysable by means of an intuitive graphical user interface (Gamper et al. 2012). In contrast to other tools for digital network mapping, e.g., EgoNet.QF (Straus et al. 2008), *VennMaker* generates data matrices of the drawn networks and offers several export options for network images and the collected data to standard statistical or network analytical software solutions for further quantitative analysis. The statements regarding the content and importance of social relationships can be audio recorded during the interview and evaluated later via content analysis methods.

The case study: A musician network

In the following case study, we explore a transcultural transformation project of the traditional carnival music of Cologne (Germany). Criticizing the ongoing musical stagnation of the carnival music of Cologne, a group of musicians and music journalists established the *Humba Party* festival series in 1995. As a child of the world music movement of the early 1990s, the party seeks to enrich Rhenish folklore with different music styles, e.g., Afrobeat, reggae and rap. The idea of this party is to create a new interpretation of world and carnival music and, by doing so, to emphasize and renew the anarchic and revolutionary traditions of the carnival itself. For this study, we are interested in the creative network that is constituted by the bands and musicians involved in the *Humba Parties* and how they cooperate in their attempt to innovate the place-specific musical culture.

Implementation: Developing a digital network map

1. Preparation: In the preparation phase of the research process, we collected a preliminary sample of nodes by generating a list of the approximately seventy artists and bands that had ever performed at the *Humba Party* from 1995 to 2015. The collection was based on the concert posters and available programme information from the official homepage of the festival. For the group interview at a later date, the generated actor list of artists and bands was preconfigured in *VennMaker*. Additionally, we conducted an exploratory telephone interview with the leader of the *Humba Party* steering committee and discussed our ideas on how to structure the study. Our first intention, to classify these artists and bands by exact musical genres, turned out not to be feasible because the artists and bands invited to the festival notoriously transcend the borders of traditional genres. Therefore, we developed together an alternative approach by classifying the bands via the main geographical origin of the musical style that they performed on the *Humba Party* stage – not the place of birth or residence of the musicians themselves. Figure 3 shows the resulting template of the digital network map with the categories "Cologne", "Germany", "Europe" and the rather abstract "World". Furthermore, we discussed the possible phases of network development over

Processes of space constitution in a transition town initiative

Who	Spacing elements	Synthesis processes	Constitution of space
Member A, B, C … *N*	People, food, drink, interior, exterior, decorations, proximity to home and work place, etc.	Perception, ideation or recall, e.g. welcoming, comfortable, easily accessible by many people, meeting friends, making possible new friends, etc.	*Place_2* is "the face of the initiative", etc.

Source: own design

Tab. 1: Processes of space constitution in a transition town initiative

time and decided collaboratively to divide the study into three time samples.

2. Data collection: In the main phase of the data collection, we conducted a face-to-face group interview with all members of the *Humba Parties*' steering committee. The committee comprises two musicians, a music journalist and his Brazilian wife, who were the initiators of the project and are still part of the organization team. After discussing the study design with the interviewees and adjusting some design decisions, the interviewees were asked to place the actors from the generated list on the digital network map according to the origin of their main musical style. We also encouraged the interviewees to discuss and nominate new artists and bands that were not on the original list. Then, the members of the steering committee were asked to link actors who musically cooperated during the *Humba Parties*. We included the sharing of rehearsal rooms as a second relation because the interviewees mentioned them as relevant for the initial phase of the *Humba Party*, as they initiated communication and cooperation. The technical part of the data collection was performed by one of the interviewers to reduce the effort of the interviewees. A longer break in the middle of the interview allowed the interviewees and the interviewers to refresh.

3. Data processing: The group interview was recorded via the *VennMaker* tool and transcribed verbatim. Furthermore, we revised the digital network maps and classified the bands or artists regarding their frequency of participation into three groups (see Fig. 3): low, with 1–2 attendances (beige), middle (red), with 3–6, and high (purple), with 7 or more.

4. Data analysis: During analysis, the interviewers evaluated the transcript via content analysis methods and used it to inform the following interpretation of the digital network maps. The prior knowledge and participant observation of one author of the study who lives in Cologne and is a member of the registered association *Humba e.V.* was also included in the data interpretation.

Findings: The Development of a musician network

Figure 3, Phase 1 shows the digital network map of the initial phase of the festival (1995–2000). Forty artists and bands participated in the *Humba Party* events during that period. The solid lines between the actors show their musical cooperation; there were 78 cooperations, with an average of 1.95 cooperations per actor. The dashed lines represent the sharing of rehearsal rooms. This physical proximity repeatedly initiated the cooperation of artists. The festival was financially and organizationally supported by the West German Broadcasting Corporation (WDR) that bore the costs for famous bands from outside Germany. In the second phase, the *Years of Travel* (2001–2006, see Fig. 3, Phase 2), the festival was still supported by the WDR and had established itself, but it changed its location several times. During this phase, 37 artists and bands attended the events; they cooperated 48 times, with an average of 1.3 cooperations per actor. In comparison to the initial phase, there was a decline in cooperative activity, and no actor had high attendance (purple). This is explained by a drop in the number of events during this period. Figure 3, Phase 3 shows the digital network map of the third phase of development (consolidation phase, 2007–2015). Since 2007, the festival has been run as an independent event with a new regular venue but without funding from the WDR. As a result, no bands from outside the region can be invited because the revenue of the party is not high enough to cover travel and accommodation costs. Forty-four actors cooperated on average 1.14 times, 50 times in total, a further decline in cooperative activity. Regarding the network as a whole, the average cooperation per actor declined from the initial to the consolidation phase. This may be interpreted as a tendency towards an establishment and conceptual saturation of the *Humba Party* festival.

For the festival's 20-year history, we looked at the most frequent participating bands and at their connectedness to other actors based on the group interview. The most connected actor, the *Schäl Sick Brass Band* (17), has participated in nearly all festivals and has continuously cooperated with numerous other musicians. Arranged and directed by members of the steering committee of the festival itself, the band grows closer to achieving the innovating goals and concurrently establishes further connections with newly attending artists and other bands. Another group of well-connected bands can be described as belonging to a *Core Network* (18, 43, 44, 65). They frequently participate and regularly introduce new songs and musical styles (red nodes). The third type of band has participated only once because – according to our interviewees' statements – their contribution does not match the idea of the party or they cannot sufficiently excite the audience (beige nodes). Comparing the number of nodes (i.e., musicians/bands) in the different phases of the development of the *Humba Party,* we identified that the majority of the musical roots are located either on the local scale of Cologne or on the world level. Due to institutional funding during the first and second phases of the festival, a few bands were invited from outside Germany or Europe. However, most of the musical styles "from […] unique and distant" localities (Connell/Gibson 2004, p. 347) are contributed by immigrants who live in Cologne themselves.

In the context of this article, we can only touch the surface of a *Humba Party*-specific *Transcultural Space of Music*. First, further research could analyse the different network components of the musician network (e.g., by visualizing sub-networks without the rest of the network elements). Second, we may edit the conceptualization and visualization of the musical styles rather than reducing them to a main geographical origin. This could be achieved by conceptualizing the musical styles themselves as (transcultural) networks. Third, the analysis of the event, with its dimensions in time and space, may explicitly address the processes of space constitution that is touched on below.

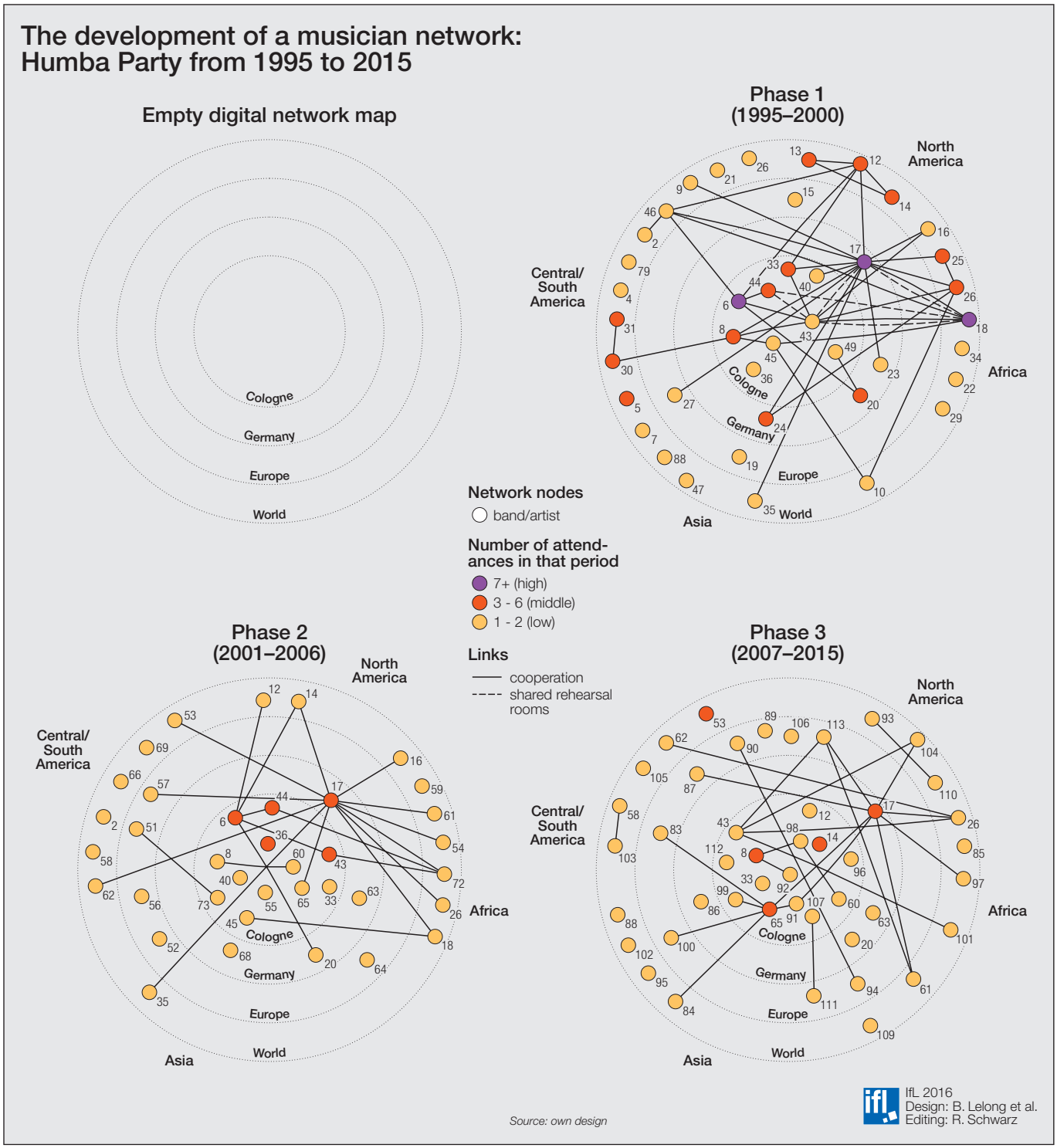

Fig. 3: The Development of a musician network: Humba Party from 1995 to 2015

Discussing the constitution of space: Analysing transcultural spaces of music

An in-depth analysis of the space constitution processes (see Tab. 2) could reveal how far the "transcultural sounds" of world music (Erlmann 1996, p. 470) form "global aesthetics in the making", (Erlmann 1996, p. 468). Or, like Steinert is proposing (Steinert 1996, p. 154), to analyse the relation between (world) music and the takeover of the stranger (Simmel 1992).

By abundantly mixing, e.g., languages, melodies, musicians' roots, and costumes, the performance of the yearly *Humba Party* may constitute well-known spaces or surprise listeners in one and the same moment, creating a space of foreignness as well as belonging for everybody – the organizers, the musicians and the audience. Further analysis may discuss these various constitution processes of foreignness and belonging,

or possible categories in-between. Eventually, the analysis could explain the various assessments of the yearly event by the organizers of the party, the participating musicians and the individuals or groups in the audience by focusing on their diverse *Synthesis* processes: The organizers may assess their aim to produce and present innovative and progressive carnival music (ideation). The result is for instance that they invite bands sharing their own values. The musicians may be delighted about meeting old friends and making new ones and about an inspiring cooperation (perception) or they may experience rivalries (perception). The audience may be expecting a carnival party in a more well-known fashion (as staged in hundreds of pubs in Cologne; ideation), they may want to hear exotic music and be inspired by new styles (ideation), or they may support their friends in the organizing team and performing bands (ideation). Accordingly, the audience's reactions range from having a great time to being bored or feeling annoyed (perception) due to the lack of mainstream carnival music (ideation). Despite some criticism, the party event is always fully booked. As shown by these examples, an analysis of the constitution of space reveals different or similar forms of synthesis carried out by different actors. The musicians, the organizers and the audience constitute similar spaces if they share the same values (importance of innovation) or if they feel they belong to the same group (perception).

Reflection: Benefits and challenges of the network reconstruction by using VennMaker

Regarding three time samples, the complexity and size of the musician network, a good pre-structuring of known features was crucial, i.e., entering the actors into the *VennMaker* software in advance to avoid this time-consuming work during the interview. In our case, the pre-structuring of the digital network map seemed to ensure enough openness for the subsequent participatory group interview. By collecting nodes and setting time frames in advance and supported by the flexibility of the software, we managed to discuss a large number of nodes and links, which was even more challenging due to the retrospectivity of some data. However, the tool produced technical restrictions: The size of the monitor determined the size of the network map and constrained the interviewees' view of the results of their discussion, which undermined the interactive potential of *Visual Network Research*. In our case, the interviewees lost interest in actually discussing the network structure as a whole. However, the participatory setting proved very useful for an in-depth discussion of structuring categories. Our study is the first attempt to reflect 20 years of party history, which could explain the interviewees' willingness to persevere through the somewhat exhausting interview.

Comparison, prospects and conclusion

In concluding, we outline and compare the benefits and disadvantages of the *Net-Map* and *VennMaker* tools for data collection and analysis. After discussing the ethical issues, we reflect upon the contributions of *Visual Network Research* to social-spatial science issues and we draw conclusions regarding future research.

Comparison: Net-Map and VennMaker in the research process

Depending on the research question of a study, the need for the standardization of research methods differs. In summary, it can be stated that *Net-Map* is particularly suitable for exploratory research designs with group discussions, whereas *VennMaker* provides a good basis for pre-structuring interviews and for comparing the networks of several cases (see Tab. 3).

Processes of space constitution in the course of the Humba Party event

Who	Spacing elements	Synthesis processes	Constitution of space
Organizers A, B, C, D	Musicians, instruments, costumes, movements, sounds, words, etc.; several hours of festival time; the organizers themselves (being on stage, backstage, in auditorium)	Perception, ideation or recall	General team members' perception: progressive carnival event, fostering innovation in carnival music & A/B/C/D's variations of this
Musicians A, B, C, … *N*	Other musicians, instruments, costumes, movements, sounds, words, etc. several hours of festival time; the musicians themselves (being on stage, backstage, in auditorium)	Perception, ideation or recall	Various constitution processes, e.g. inspiring or surprising event, border-crossing platform for experiments
Audience: Individuals or groups A, B, C, … *N*	Musicians, instruments, costumes, movements, sounds, words, etc.; several hours of festival time; individuals themselves (being in auditorium)	Perception, ideation or recall	Various constitution processes of individuals or groups (great, inspiring, surprising, boring, not enough carnival feeling, etc.)

Source: own design

Tab. 2: Processes of space constitution in the course of the Humba Party event

Due to its flexible set-up, the *Net-Map* tool is particularly suitable for explorative studies, where not much is known about the situation and the goal is to obtain a first overview. As shown in the case study in chapter two, group settings are particularly useful in transdisciplinary studies, where the goal is to produce not only scientific knowledge but knowledge that is also useful for participants. Other advantages of *Net-Map* are its low preparation costs: It can be used nearly everywhere because the basic materials, pen and paper, are easily available and affordable. Researchers are independent of electricity and high-tech equipment, and interviews can be conducted outdoors. Furthermore, the tool is free of royalties, and it is easy for researchers and practitioners to understand and to apply, even without specific software or computer skills. During data collection, the participatory network reconstruction and the results of the interview are spread out on the table, which encourages reflection and discussion throughout the whole process. The network maps further allow a direct analysis of the network together with the participants. As shown in Herz et al. (2015), the maps can also be analysed by the researchers directly after the group discussion without digitizing the data.

However, the interactive and flexible setting is simultaneously a drawback, making it difficult to compare between case studies on a quantitative level because the question needs to be adapted to a particular situation to be beneficial for the participants. If this is not done, or the number of actors exceeds approximately 30 nodes, network maps become overly

Comparing Net-Map and VennMaker

Phase	Pen-and-paper network mapping (Net-Map)		Digital network mapping (VennMaker)	
1. Type of research or goal of application	Explorative studies Transdisciplinary studies Interactive participatory research, action research Suitable for stakeholder analysis and strategic network development Less suitable for systematic, quantitative, and comparative research designs		Explorative studies Transdisciplinary studies Currently, interactive participatory research is limited due to hardware constraints Suitable for systematic, quantitative and comparative research designs	
	NETWORK SIZE, TYPE OF DATA S- and M-sized networks (up to approx. 30 nodes) Generating relational & attributional data, quantitative & qualitative data		NETWORK SIZE, TYPE OF DATA Suitable for S- / M- / L-sized networks with up to approx. 70 nodes, no XL networks Generating relational & attributional data, quantitative & qualitative data	
2. Preparation costs	RESOURCES: EXPERT KNOWLEDGE, ROYALITIES, TIME Basic knowledge of network concepts Straightforward tool, basic training beforehand needed No royalties, low-cost and low-tech Structuring together with participants is time saving		RESOURCES: EXPERT KNOWLEDGE, ROYALITIES, TIME Basic knowledge of network concepts Easy software, training and testing beforehand needed Royalties, but affordable software Prestructuring of XL or multi-layered networks is time-consuming	
3. Data collection	ADVANTAGES Group settings, participatory network reconstruction Haptic display facilitates reflection and discussion Amalgam of data collection and analysis	CONSTRAINTS Pen-and-paper mode restricts modifications during data collection/visualization Time-consuming face-to-face meetings	ADVANTAGES Amalgam of data collection and analysis Digital display of network during data collection Easily modifying visualization during data collection	CONSTRAINTS Less suitable for large group interviews Less interactive potential
4. Processing of data	ADVANTAGES No advantages	CONSTRAINTS Time-consuming and error-prone transfer into digital data	ADVANTAGES Digital network data Various design possibilities for network elements	CONSTRAINTS No constraints
5. Data Analysis	ADVANTAGES Amalgam of data collection and analysis Combination of quantitative SNA and qualitative data analysis procedures	CONSTRAINTS No statistical computing	ADVANTAGES Amalgam of data collection and analysis Combination of SNA and qualitative data analysis procedures Filtering possibilities, graphical supplements	CONSTRAINTS Only basic statistical computing

Source: own design

Tab. 3: Comparing Net-Map and VennMaker

complex, time consuming, and confusing and can obstruct the immediate analysis and discussion with the interviewees. Moreover, the *pen-and-paper* method restricts the flexibility to make corrections.

Regarding data collection and processing, *VennMaker* takes into account some of the disadvantages of *Net-Map*. Researchers can correct wrong entries and select from a large set of shapes and colours to represent different types of actors and relations (cf. Gamper et al. 2012). The simultaneity of data collection and data entry provides a digital network map; thus, a transfer of the data is not required, which saves time and minimizes error probability. Beyond that, *VennMaker* documents the outcome of the interview and the evolution of the network map. The process of data collection can be presented as a film and is connectable to an audio file that echoes the original interview situation. As in the pen- and-paper mapping process, the digital network maps allow a direct analysis of the network together with the participants (for group interviews a common projector is needed). During analysis, the researcher can reduce complexity by filtering out specific types of actors and relations. To conclude the comparison of both tools: *Net-Map* is a tool for exploratory and transdisciplinary research designs with group discussions. The preparation costs are low, but data collection and data processing are often time-consuming. *VennMaker* is a tool for exploratory and transdisciplinary research designs with individual or group interviews. The preparation costs are medium; the time effort depends on investment in preparation and the network size.

Discussion: Ethical issues

A challenge that both tools have in common, along with many other empirical social scientific methods and Social Network Analysis in general, is the handling of sensitive data. Depending on the social relations drawn, information can be sensitive and personal. Furthermore, many consider their relationships as social capital, and sharing information on it makes them uncomfortable because they might lose a strategically advantageous position. Moreover, links to actors that are controversial or are positioned on the fringe of a network might bear the risk of stigmatization or worse. Another critical issue is that information on actors who are not present during the interviews or group discussion is revealed, restricting the actors from intervening (Borgatti/Molina 2003; Kadushin 2005).

Although this goes hand-in-hand with limitations for scientific knowledge generation, there are a number of ways to address these issues, such as the anonymization of actor names. It was an exciting exercise to do this together with the participants in the *Net-Map* case study, but it usually can be done by the researcher before the publication. However, simply replacing the names of actors might not be enough to prevent the identification of certain constellations. In this case it is also important to disguise the context, for example, by not revealing which initiative or project is discussed and which region or country is covered.

Prospects: Visual Network Research for social-spatial sciences

Conceptually, *Visual Network Research* provides a bridge between standardized methods and unstructured qualitative research (e.g., Gamper et al. 2012). On the one hand, by following pre-defined steps, the approach helps to structure and systemize complex information and data. On the other hand, qualitative data, collected as network narratives throughout the interview, are necessary to understand the network structure. Furthermore, *Visual Network Research* produces quantitative network data that can be analysed with classical SNA approaches. To some extent, such a mixed-method approach supports a formal quantitative-orientated network analysis that allows the comparison of different cases and a certain generalization of the findings. Concurrently, it provides a more in-depth understanding of the ways in which social relations engender constraints and opportunities for actors and how actors may use these to reach their goals.

Concerning space, *Network Research Studies* can investigate how actors produce and constitute spaces or how spatial structures influence the societal structure. This includes perspectives with a focus on governance processes that are conceptually capable of incorporating influences from all political levels on different geographical scales (Lelong 2014, p. 225; Hauck et al. 2016). Furthermore, network approaches are used to cope with the micro-macro divide by integrating attributes of individuals, effects of the network structure on a meso- level, and macro-level influences such as cultural norms or global economic trends (Lelong 2015, p. 159). By focusing on issues of space constitution during the research process, *Visual Network Research* can help understand how actors constitute space and on what type of material arrangements, concepts, or ideas their constitution is based (see Tab. 4 below). In our paper, we discuss cases that include places as network actors who are essential to enabling specific social interactions. As a result, in the event of their disappearance, they may cause a (temporal) breakup of a social network, as in the case of the network of the transition town movement. Drawing on the relational constitution of space (Löw 2001), further research could explicitly explain why that one place became existentially relevant. This is also true for the case of the *Humba Party* network, which we reconstructed and visualized through digital network mapping. Here, the participatory data collection and analysis enabled a reflection of twenty years of party history and a discussion on the abundant mix of musical styles. In this case, an investigation of the subjective constitutions of space could reveal further explanatory features for the perception and development of the *Humba Party* festival and world music in general. Based on our experience, and as a first overview, we suggest the following steps for combining *Visual Network Research* and Löw's relational theory of space (Löw 2001):

Other concepts related to a social construction perspective of space (for an overview, see, e.g., Thrift 2006; Dünne/Günzel 2006; Rau 2013; Kajetzke/Schroer 2015) could enrich this *Visual Network Research* approach to space constitution that is in the making. Regarding this discourse on "spatialisation" (Schroer/Kajetzke 2010), further research may examine how different theoretical approaches may contribute to and elaborate on the research agenda we have outlined above. This could include writings that relate to diverse perspectives such as (neo-) Marxism, structuration theory, poststructuralism and *Actor-Network Theory* (Kajetzke/Schroer 2015, p. 9).

The abovementioned examples illustrate that *Visual Network Research* can be combined with a great number of social theories, including human geography, sociology, political science and governance research. However, even this openness has its limitations because the structuring effect of *(Visual) Network Research* naturally reduces the broadness of qualitative research, directing researchers' focus to predefined categories. The richness of the qualitative data may be reduced, and alternative insights may be neglected when evaluating the data. Researchers should be aware that even the interviewees' statements may be guided by network theoretical features and may therefore lose their authentic character. Furthermore, the simultaneous investigation of a set of actors, their relationships, their subjective meanings and their perceived influence comprises a challenging task. Interviews tend to be lengthy and exhausting for both interviewers and interviewees. By pre-structuring the features of the actor constellation as much as possible, researchers are able to reduce the length of interviews. Of course, this further augments the standardized character of the interview and should always be taken into consideration by the researcher.

Conclusion: Towards a richer understanding of social action and space

Being a part of the research agenda towards a richer understanding of social action and space, our paper discussed the potentials of a combination of *Visual Network Research* and the relational sociology of space (Löw 2001). We delineated the types of research questions that can be investigated by this conceptual and

Investigating the constitution of space by performing Visual Network Research

Phase of research process	Investigating the constitution of space by performing Visual Network Research
1. Type of research or goal of application	ASK Constitution of space as the main research question or one explanatory factor amongst others? Which processes of space constitution should be investigated? Why? Explorative study? Interactive participatory research, action research? Practical application for stakeholder analysis and strategic network development? Comparative research design? Network size and type of data? > Pen-and-paper or digital network mapping
2. Preparation	SORT OUT Basic knowledge of theory and methods of space constitution Depth of the analysis? Focus of the investigation: whose perspectives should be analysed? How are constitution process and modes of data collection and visualization related? What comprises the spacing process? What comprises the synthesis process? Can they be understood as nodes and edges? How many resources are available? > Pen-and-paper or digital network mapping
3. Data collection during network mapping process	SPACE-RELATED FOCUS Space-related motivations / goals of actors (i.e., Net Map step 4, see figure 1) Exchange of resources indicates spacing of elements and living entities and the assessment of their relevance (i.e., Net Map step 2, see figure 1) Perceived influence indicates space constitution processes (i.e., influence towers, Net Map step 3, see figure 1)
4. Processing of data	Transcribing (group) interview of pen-and-paper or digital network mapping Digitalizing pen-and-paper network map
5. Data Analysis	Documentary method, frame analysis, etc. Qualitative coding: labelling of spacing processes and synthesis processes as the analytical processes of the constitution of space
Résumé	Including processes of space constitution into the research design of network research enhances the understanding of societal processes but requires training and further development of space-specific network research methodology

Source: own design

Tab. 4: Investigating the constitution of space by performing Visual Network Research

methodical approach and how researchers may design their research. The haptic *Net-Map* and the software *VennMaker,* two different tools of *Visual Network Research,* were introduced and discussed by presenting two socio-spatial case studies, one on a transition town initiative and one on a transcultural musician network.

Regarding the advantages and disadvantages of the different tools (see Tab. 3), we noted that the choice to use *Net-Map* or *VennMaker* as a research tool largely depends on the interview situation and the interviewees or target group of the study (Schönhuth 2013). *Net-Map* seems to be more convenient for interactive participatory research with group discussions and a target group with an affinity for a haptic mode of operation. Regarding comparability, *VennMaker* supports the researcher's obligation to follow certain standardizations. Due to its pre-defined features, interviewers are less vulnerable to comply with interviewees' demands for idiosyncratic specifications.

The major benefit of *Visual Network Research* in socio-spatial research is its participatory character. This sort of collaborative research design offers the possibility of integrating a step of communicative triangulation during visual data generation. Interviewees are able to visualize and qualitatively evaluate their networks while simultaneously reflecting on the network structure and genesis together with the researcher. They may even able to consider desirable alterations or the potential for the transformation of the social structure of which they are part. When interviewers and interviewees navigate the map, the stories behind the nodes and the edges can be elicited. Last but not least, network drawings provide an immediate and compact prospect of complex webs of relations and substitute large lists with voluminous data about the connections or non-connections among all actors. Visualizations can aid the knowledge or research process by generating insights that otherwise may have stayed unnoticed.

Compared with more established network analysis methods, *Visual Network Research* is more appealing as it refrains from using time-consuming questionnaires about different actors and their relationships. Generating sketches, maps, or pictures and directly seeing the results motivates participants during the sometimes long-lasting interviews and obviates "research fatigue" (Stevenson 2003, p. 2). Additionally, the visualization often stimulates the interviewees to reflect on the specific actor constellation that they are describing. This makes *Visual Network Research* very suitable for social-spatial sciences inasmuch as places can be included as actors into the network visualization in order to highlight the relevance of space for social action. Moreover, the participatory character shows its strength while focusing on processes of space constitution. During all phases, space-related foci may guide the research process (see Tab. 4) to add the explanatory substance of spatial features to the understanding of societal phenomena. In both research cases, we could identify research issues that require a relational understanding of space for further study (the importance of *Place_2* for the transition town network; the different constitutions of space by organizers and individual visitors of the *Humba Party*). Here, the analytical components of *Visual Network Research* – the nodes and the links – might be understood as analytical elements of actors' constitution of space. In the context of this paper, we presented a rough guide for a network research approach to the understanding of space constitution, in the sense of actively connecting living entities, social goods or their symbolic aspects (Löw 2001, p. 158; Löw 2008, p. 35). Therefore, further research should conceptually and methodically elaborate on the fruitful combination of Visual *Network Research* and Löw's relational theory of space (Löw 2001).

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Резюме

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К вопросу о построении визуальной сети социального взаимодействия и пространства: партиципативные исследования в географии с использованием Net-Map и VennMaker

Различные подходы в области сетевых исследований приобретают всё большее значение в географии. В последнее время ученые используют аналитические сетевые подходы для анализа социальных структур и дискурсов. Относительно новая форма анализа социальных сетей (*SNA*) – визуальные сетевые исследования. которые с помощью т.н. сетевых карт, используя премущественно партиципативные подходы, собирают и анализирует информацию в области социально-общественных отношений. В статье на конкретных примерах анализируются специфические возможности и проблемы применения этого визуального сетевого подхода в пространственных исследованиях, и обсуждается применение сетевых карт в рамках двух различных инструментариев обследования. *Net-Map* позволяет вручную составить карту с использованием результатов нтервью, в т.ч. фокус-групп. При этом генерируются качественные и количественные сетевые данные, оценка влияния целей и ролей, например, в отношении пространственных масштабов или ресурсов субъектов. Программное обеспечение *VennMaker* также является инструментом для партиципативной реконструкции сетей, при этом сети отображаются на компьютере совместно с интервьюируемыми. Таким образом, может быть одновременно получены также количественные реляционные и атрибутивные данные, триангулированные с качественными показателями. С использованием конкретных примеров в статье рассматриваются преимущества и недостатки обоих инструментариев и предлагается дальнейшее концептуальное и методологическое развитие визуального сетевого анализа, интегрирующего процессы производства пространства.

Методы визуальных исследований*;* партиципативные методы*;* социальный сетевой анализ*;* комплексные методы*;* производство пространства*;* движение «*Transition-Town*»; мировая музыка

Résumé

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Une perspective visuelle d'un réseau d'interaction sociale dans l'espace: recherche collaborative dans les sciences de l'espace avec carte réseau et VennMaker

Les différentes possibilités offertes par la recherche sur les réseaux revêtent une importance croissante dans les sciences de l'espace. Ces derniers temps, les scientifiques ont de plus en plus souvent recours, dans le cadre de leurs travaux sur l'espace, à une perspective analytique des réseaux, qui permet de saisir et d'éclairer les discours et structures sociales. Parmi les dernières formes prises par l'*analyse des réseaux sociaux* figure la *recherche visuelle sur les réseaux*, qui appréhende et analyse, généralement de manière collaborative, les relations sociales à l'aide d'une « cartographie du réseau ». La présente contribution évoque les opportunités et défis spécifiques à la perspective visuelle des réseaux dans la recherche spatiale. Pour cela, elle présente l'utilisation de cartes réseau dans deux ateliers différent et étudie les problématiques spatiales à l'aide d'études de cas. *Net-Map* est un *instrument «papier-crayon»* qui sert à dessiner manuellement de multiples réseaux en collaboration avec des personnes interrogées ou des groupes cibles. Il permet ainsi de générer des données qualitatives et quantitatives sur le réseau, d'évaluer les influences, les objectifs et les rôles, par exemple ou niveau de l'échelle spatiale ou des ressources des acteurs. Le logiciel *VennMaker* est également un outil de construction collaborative de réseau, mais dans ce cas les réseaux sont dessinés à l'ordinateur en collaboration avec la personne interrogée. Il est ainsi possible d'élaborer une carte réseau (numérique) et simultanément de saisir des données quantitatives sur les attributs et les relations, données qui pourront ensuite être triangulées pour dialoguer avec des données qualitatives. Notre contribution discute, à partir d'exemples concrets d'applications spatiales, les avantages et les inconvénients des deux outils et propose une méthode conceptuelle de développement de la *recherche visuelle sur les réseaux* intégrant les processus de constitution de l'espace.

Méthodes de recherche visuelles; méthodes collaboratives: analyse des réseaux sociaux; méthodes mixtes; constitution de l'espace; mouvement des villes en transition; musiques du monde